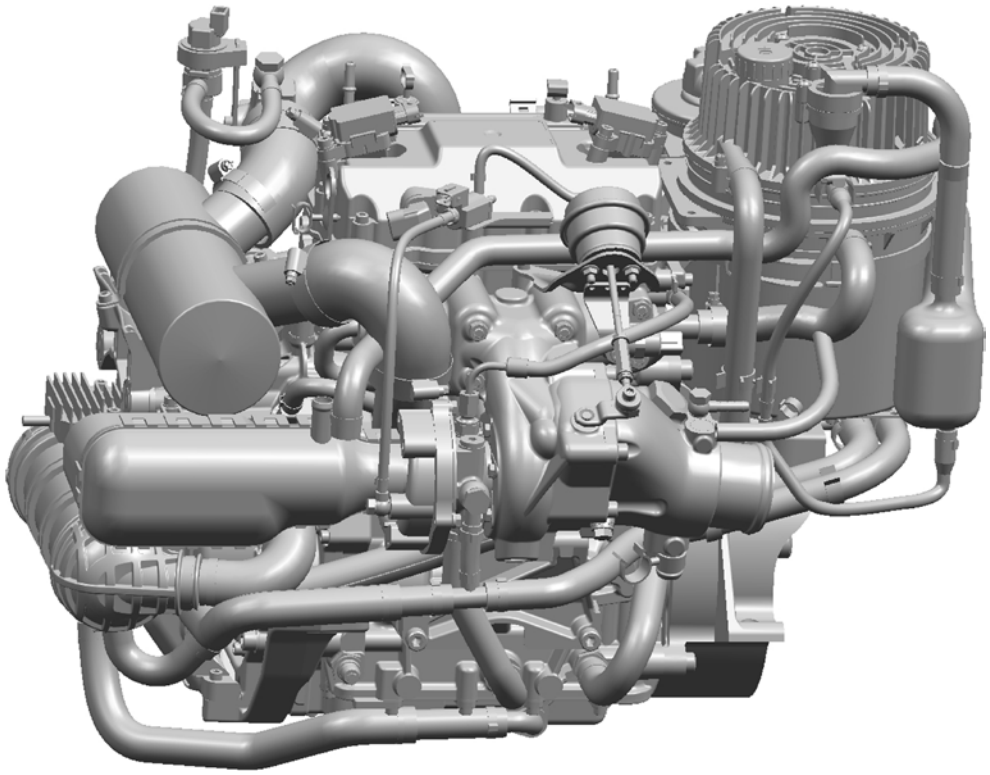
Weber Automotive

MPE 750 Turbo Marine - Closed Loop



This Installation Guide is valid for the following engine variants:

- 103666_I2 749 MAR TC-100 DS V4 2007 3.1
- 103730_I2 749 MAR TC-143 DS V1 2007 3.1

Weber Automotive

Table of contents

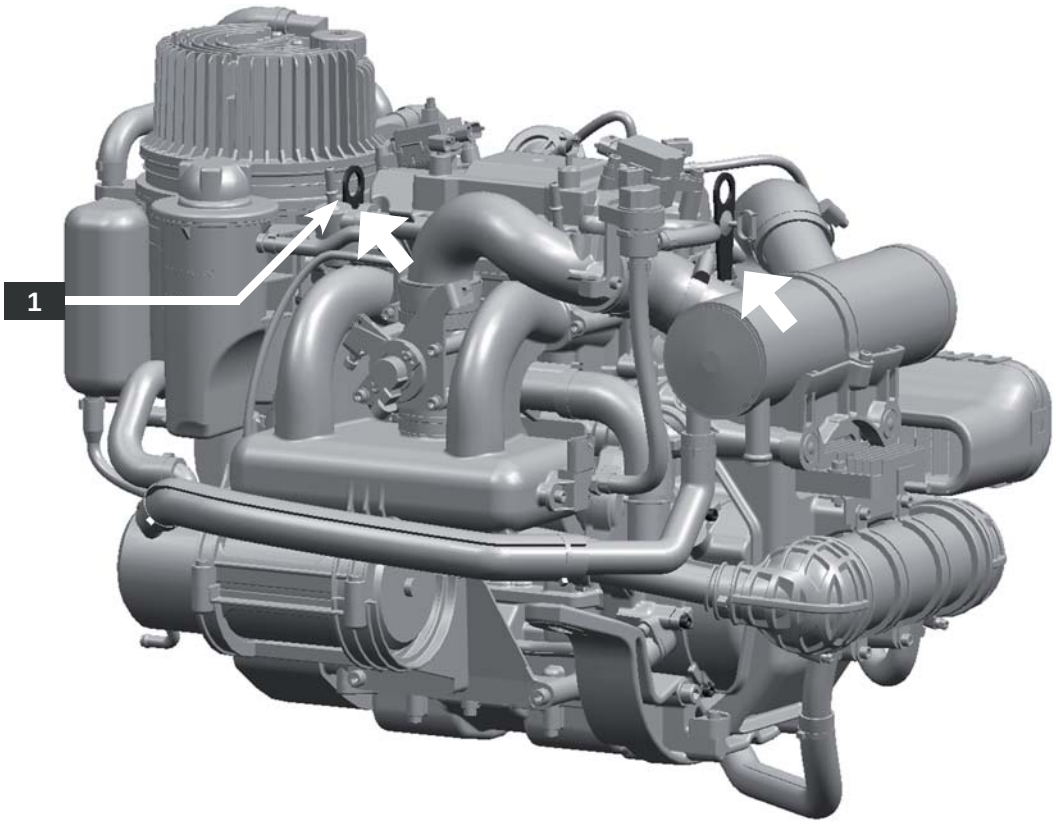
1	Mechanical Installation	1
1.1	Engine lift	2
1.2	Engine fixation and decoupling	3
1.3	Power Take Off (PTO)	4
1.4	Throttle cable	5
2	Alignment engine to drive train	6
3	Fuel system	7
4	Cooling water	10
4.1	Supply sea water	12
4.2	Flush system	13
4.3	Boat tow	14
5	Exhaust system	15
6	Electric	17
6.1	Engine monitoring	18
6.2	Schema engine wire harness	19
6.3	Schema boat harness	20
6.4	Required connectors for boat harness	21
7	First run and brake in of engine	22
8	Maintenance	24
9	Serial release	25
10	Specification for fuel, oil and coolant	26
11	Basic dimensions	27
12	Reference addresses	28
13	Appendix	29

1 Mechanical Installation

The following section describes the handling of the engine during installation and the assembly into the boat.
In general a clearance of 50 mm between engine and boat hull is required.
Vent openings of an area of 9000 m² is needed to give the engine enough air to operate.

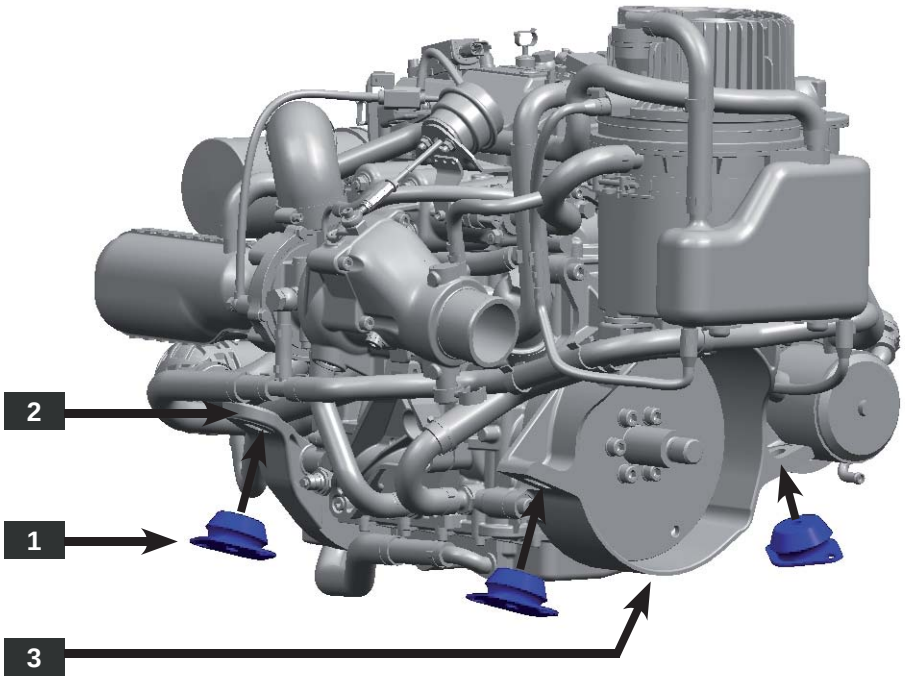
1.1 Engine lift

The engine has two lift eyes (1) at the cylinder head. Only use these eyes to raise the engine.



1.2 Engine fixation and decoupling

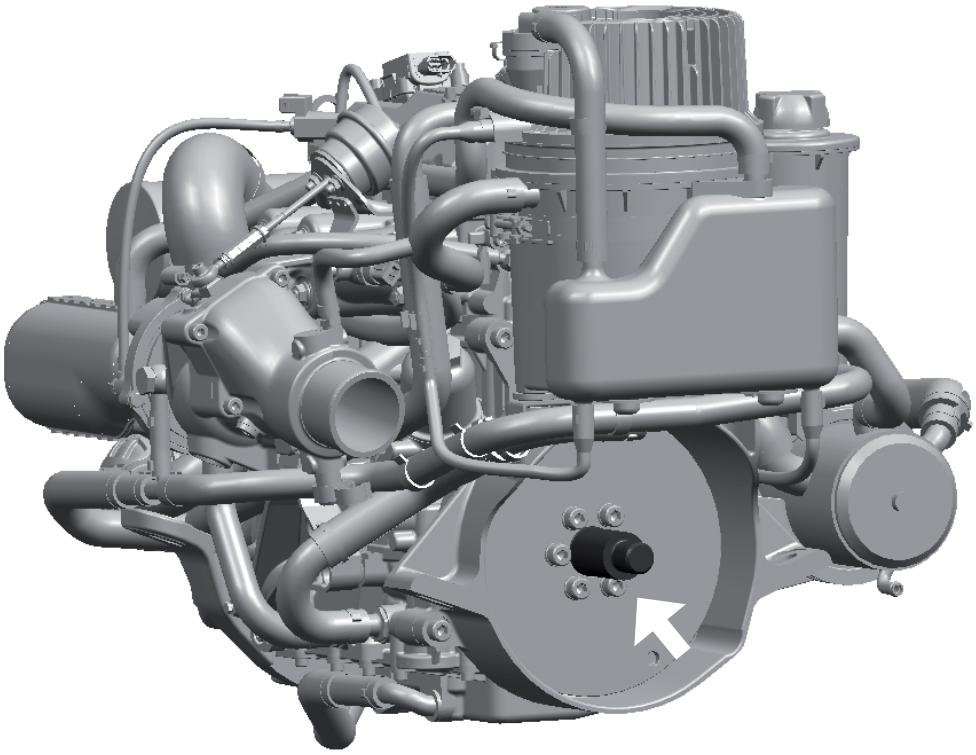
The engine mounts are specific for marine applications, a decoupling to the boat is necessary. The picture shows the placement and proposed engine bearings (1) of the marine engine.



Pos.	Part No	Description		QTY
1	100527	engine mount	D62 H30 M12	4
2	102535	engine bracket front		1
3	100119	engine bracket rear		1

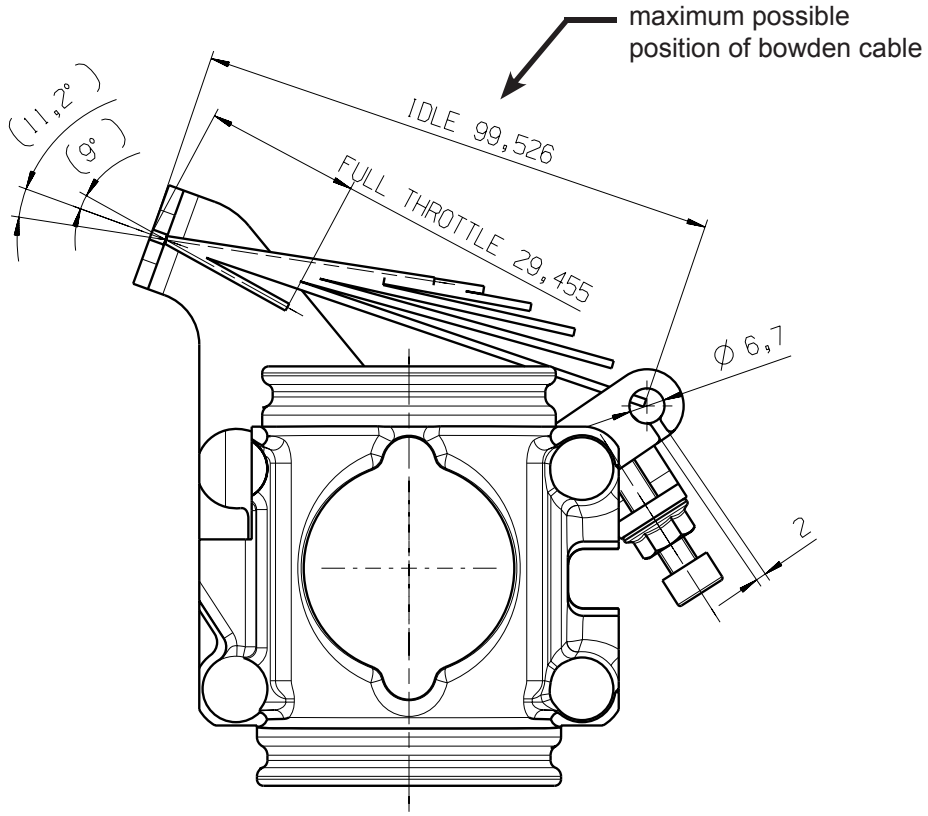
1.3 Power Take Off (PTO)

The connection to the drive train is by a thread M24x2 on the PTO of the engine



1.4 Throttle cable

The engine has a mechanical throttle body which has to be activated by a marine throttle cable. The travel of 70 mm is designed to meet the function throttle levers like the Teleflex JBS system.



The Teleflex JBS system is designated for jet boats and is available e.g. at Allpa Marine Equipment, part number CH2300

2 Alignment Engine to Drive Train

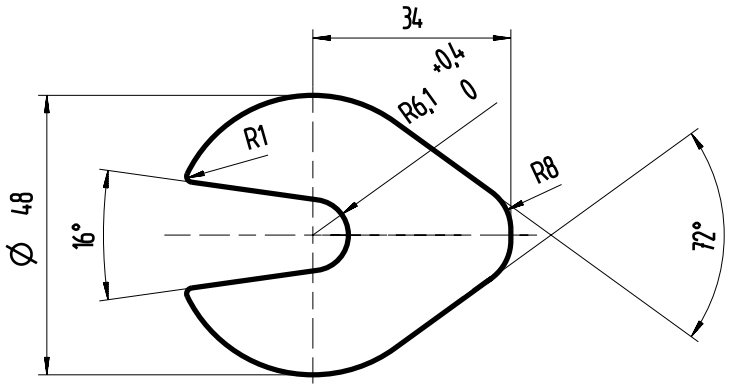
The alignment of the engine to the drive train has to be in following limits

Radial alignment: max. 0.8 mm [0.03 inch]

Angular alignment: max. 0.5°

To check and adjust the alignment between the engine and the Weber Automotive Jet Propulsion System a Weber Automotive alignment tool was designed. This tool is using a laser to get the engine with drive system set up properly. The use of this tool is described in the installation manual of the Weber Jet Propulsion System.

To adjust the alingnment engine shims (1) are available at Weber Automotive

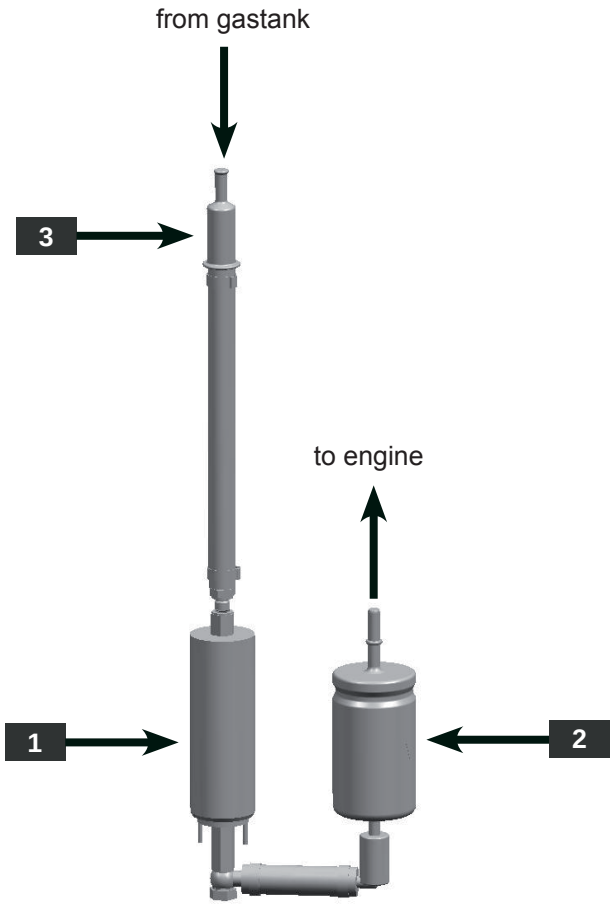


Part No	Description	Thickness
103708	engine shim	0,5 mm
103707	engine shim	1,0 mm

3 Fuel System

The fuel pump (1) has to deliver 120 liters per hour at a pressure of 4.5 bar. A possible pump and filter configuration is shown in the following picture. To ensure a safe and adequate fuel delivery a minimum inner diameter of 8 mm is required for fuel hoses and fittings. This includes fittings on the gas tank including gas pick up in the tank.

1) fuel pump
2) main filter
3) pre filter



Fuel filters (2) (3) have to be used to be avoid damages on the fuel pump and malfunction of the fuel injectors:

Prefilter (3):

- 105 µm
- e.g. Pierburg 4.000.30.80.0

Mainfilter (2):

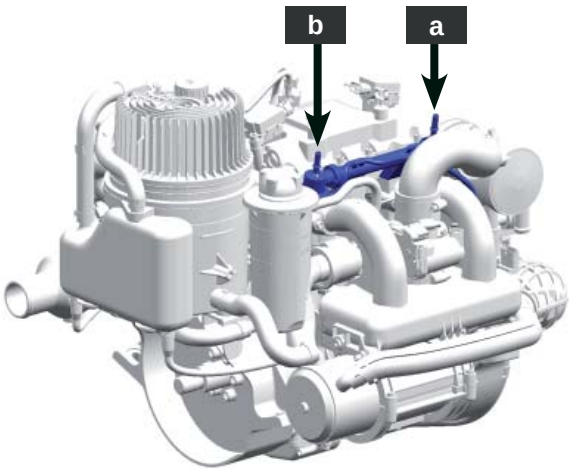
- 15 µm, filtergrade 95%
- e.g. Mann&Hummel WK512

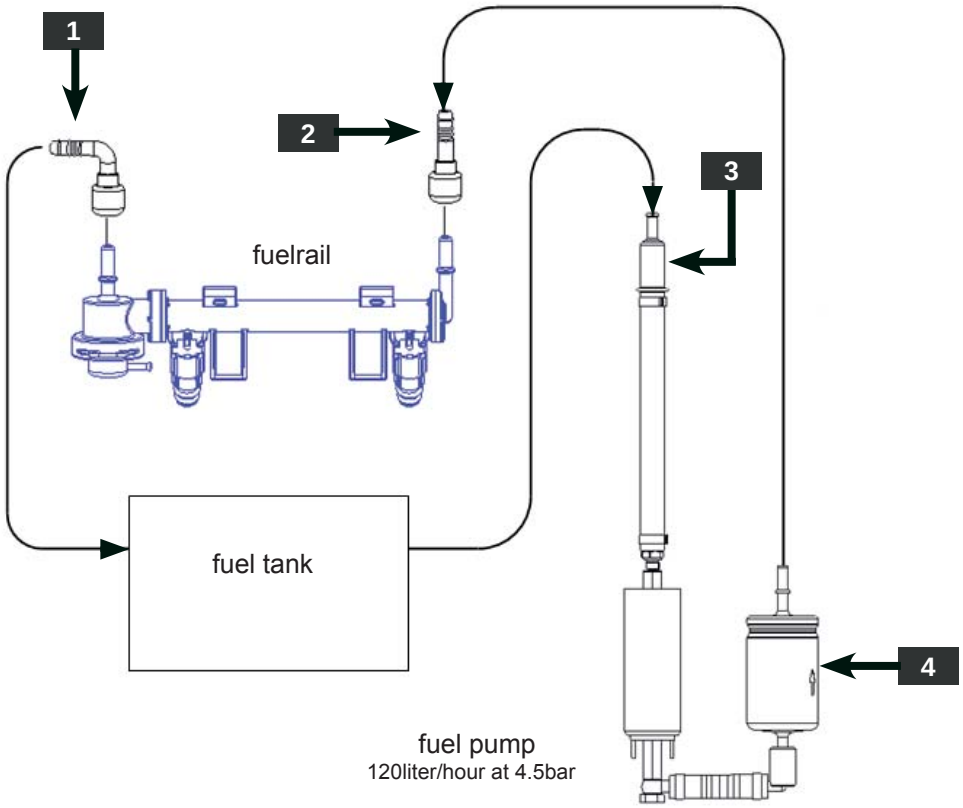
3 Fuel System

The fuel rails fittings ars designed conform to SAE J2044. The use of quick connectors (1) (2) is strictly recommended.

(a) Fuel Feed Line from Fuel Pump: Fitting SAE J2044 diameter 7,89 mm for quick connector

(b) Fuel Return Line to tank: Fitting SAE J2044 diameter 7,89 mm for quick connectors





Pos.	Order No	Description	Specification	Manufacturer
1	104227	quick connector	7,89x90°	Weber
2	104228	quick connector	7,89x180°	Weber
3	103450	fuel filter, pressure side		Mann & Hummel WK512
4	103397	fuel filter, intake side		Pierburg 4.000.30.80.0

3 Fuel System

The engine and the fuel components including recommended fuel filters and stainless steel fuel quick connectors are conform to:

- USCG: Boatbilder handbook Subpart J - Fuel Systems:

  Title 33 CFR Sections 183.501-183.590

- DIN EN ISO 10088 - Pemanently installed fuel systems and fixed fuel tanks

Consult the specifications for gas tanks, fuel pump and fuel line installation of USCG Boatbilders handbook and the Directive 94/25/EG last amended by 2003/44/EG

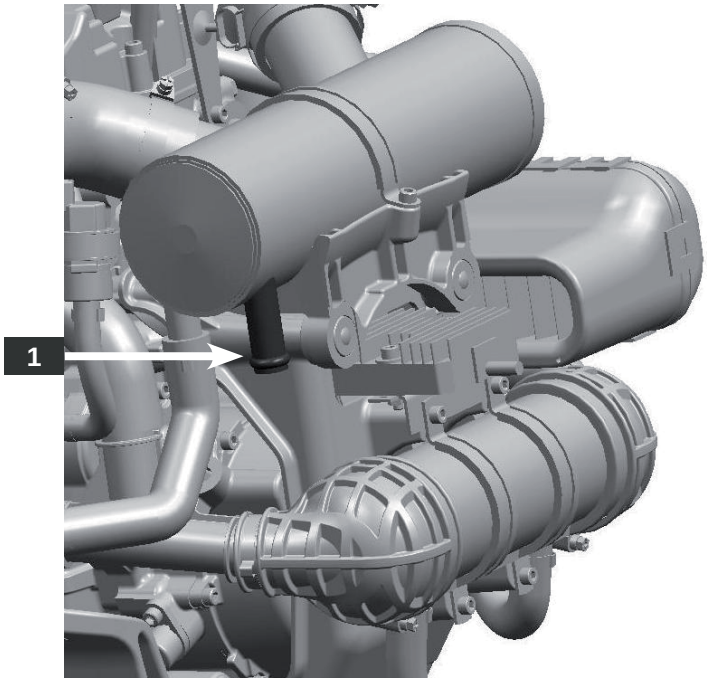
4 Cooling Water

The engine itself has no water pump to feed the open loop of the cooling system. In a combination with a jet pump the sea water for cooling is delivered by the jet pump propulsion system. By using different propulsion systems a water pump has to be integrated into the drive train.

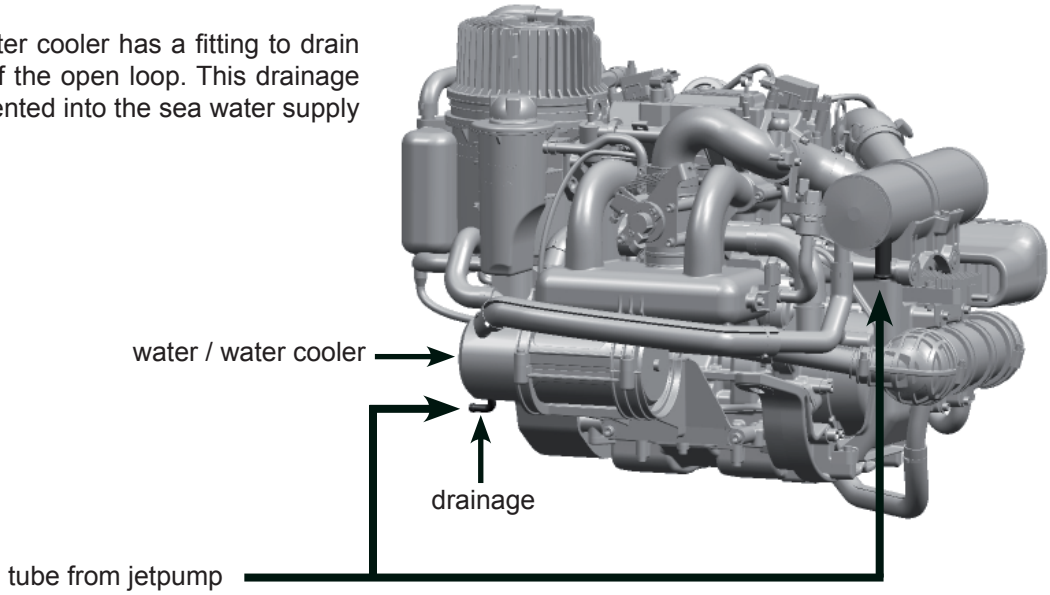
The tube for the sea water supply has to be mounted to the fitting at the charge air cooler

103666_I2 749 MAR TC-100 DS V4 2007 3.1

(1) Fitting at charge air cooler for sea water supply. Inner diameter of tube: 19mm



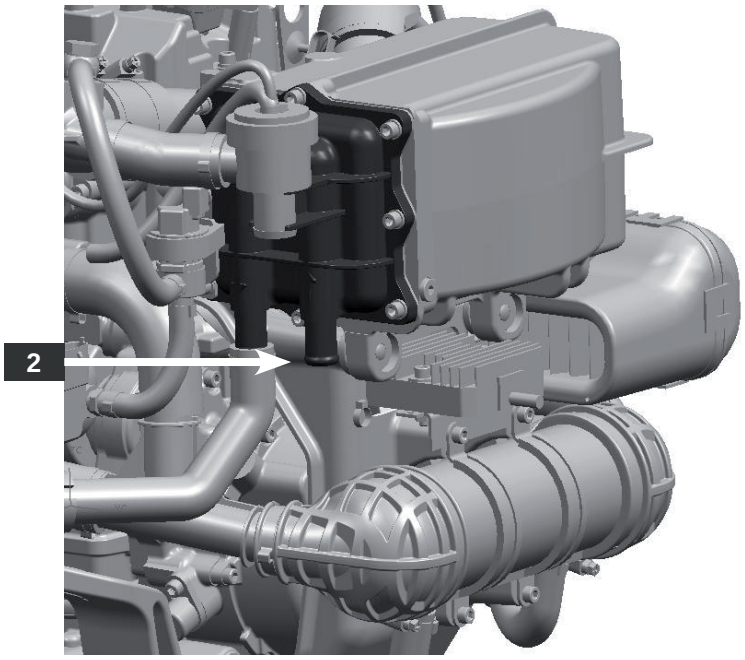
The water / water cooler has a fitting to drain the water out of the open loop. This drainage can be implemented into the sea water supply tube.



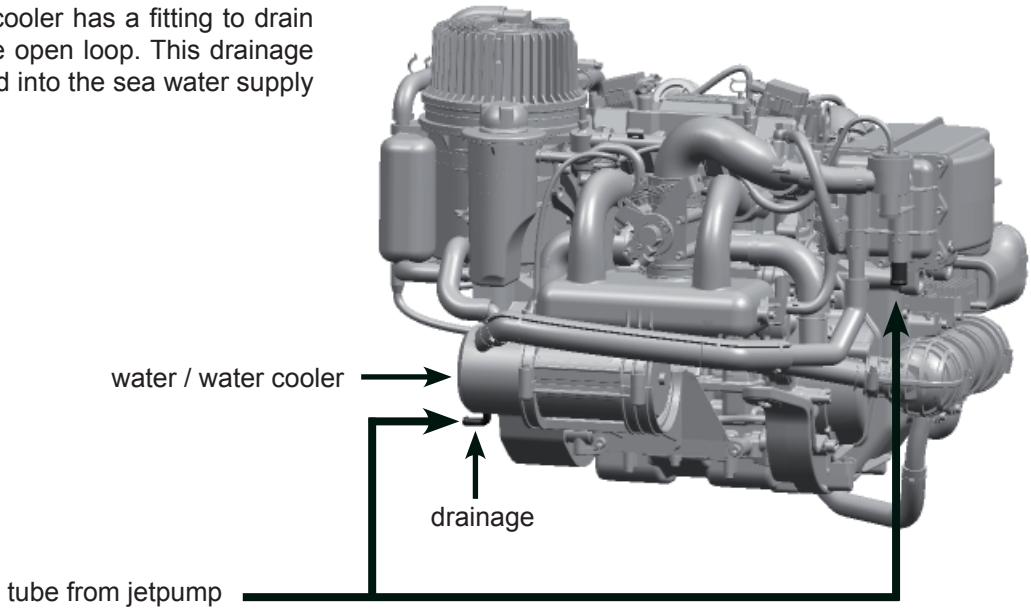
4 Cooling Water

103730_I2 749 MAR TC-143 DS V1 2007 3.1

(2) Fitting at charge air cooler for sea water supply . Inner diameter of tube: 19mm



The water / water cooler has a fitting to drain the water out of the open loop. This drainage can be implemented into the sea water supply tube.



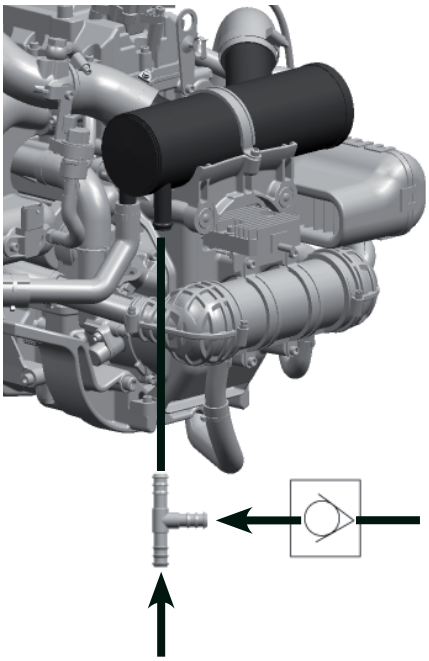
4.1 Supply Sea Water

The delivery of sea water of the open loop cooling circuit has to meet the specification listed in the table.

engine speed	**Engine: 98 - 105 kW**		**Engine: 49 - 76 kW**	
	Fresh water pressure HO cooling system (at pump outlet Line)	Waterflow HO system	Fresh water pressure SO cooling system (at pump outlet Line)	Waterflow SO system
[rpm]	[bar]	[l/min]	[bar]	[l/min]
1500	0.25	13.40	0.18	11.00
2000	0.26	17.50	0.22	12.20
2500	0.38	21.40	0.20	13.00
3000	0.58	26.20	0.25	15.00
3500	0.77	32.00	0.35	19.00
4000	0.98	36.70	0.51	24.00
4500	1.22	40.70	0.69	29.50
5000	1.49	47.20	0.92	35.00
5500	1.85	54.60	1.19	41.00
6000	2.20	61.60	1.53	46.50
6500	2.62	67.80	1.84	53.00
7000	3.00	71.70	2.20	59.00
7500	3.39	74.00	2.51	63.50

4.2 Flush System

Especially for the use of the boat in salt water a flush system to rinse the open loop cooling circuit is recommended. Therefore a flush system has to be implemented by the boat builder. The following picture shows an example how to implement this kind of system.



The engine has a wet exhaust system. This means sea water is injected into the exhaust out of the open loop cooling circuit. Due to this water injection the exhaust temperature and also noise is reduced. This water is pressed out of the exhaust system by the exhaust pressure of the engine. If the engine does not run there is no mechanism to drain the exhaust system.

Flush procedure:

- Connect the Flush kit
- Start the engine and operate only in idle. Do not accelerate
- Ensure the water supply within 30 seconds
- Flush the open loop cooling circuit for one minute minimum
- Stop water supply
- Stop engine within 30 seconds
- Remove the flush kit

ATTENTION

Never flush without a running engine otherwise there is a high risk to fill the engine with water

The engine may only be operated at idle speed for maximum of 30 seconds without flush water

4.3 Boat tow

In combination with a jet propulsion system there is a risk to fill the engine with water by towing the boat.

The engine has a wet exhaust system. This means sea water is injected into the exhaust out of the open loop cooling circuit. Due to this water injection the exhaust temperature and also noise is reduced. This water is pressed out of the exhaust system by the exhaust pressure / stream of the engine. If the engine does not run there is no mechanism to drain the exhaust system.

By towing the boat the jet pump system delivers sea water to the engine even without running engine. This means water will be injected into the exhaust system. When the exhaust system is fully filled with water it will fill the engine with water.

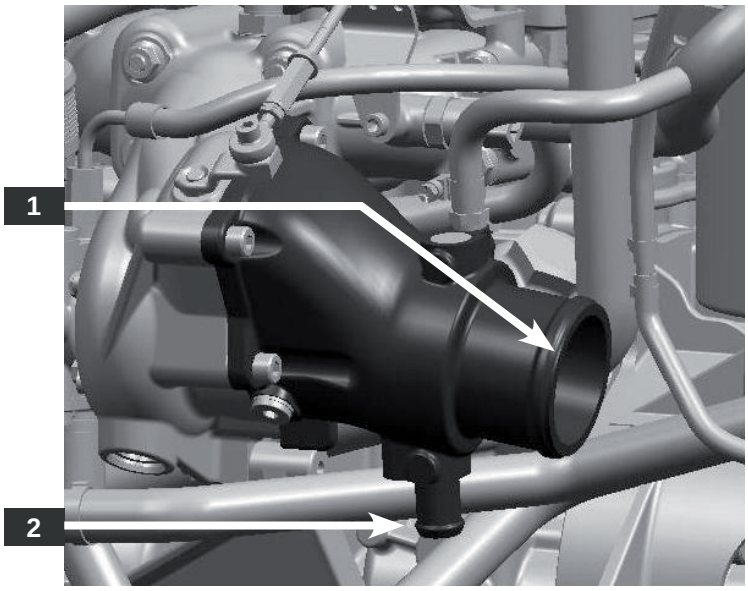
ATTENTION

Don’t tow the boat with a high speed. If a high tow speed is necessary the water feed tube between jet pump and engine has to be closed by a clamping device or a closure valve has to be installed.

5 Exhaust System

The exhaust system of the spark ignition marine engine is water cooled. A part of the sea water is injected into the manifold to reduce the exhaust temperature and the noise in the system. This injected water will leave the boat through the exhaust system (1).

The rest of the sea water leaves the engine through a fitting (2) at the bottom of the exhaust manifold. This water has to be drained out of the boat.

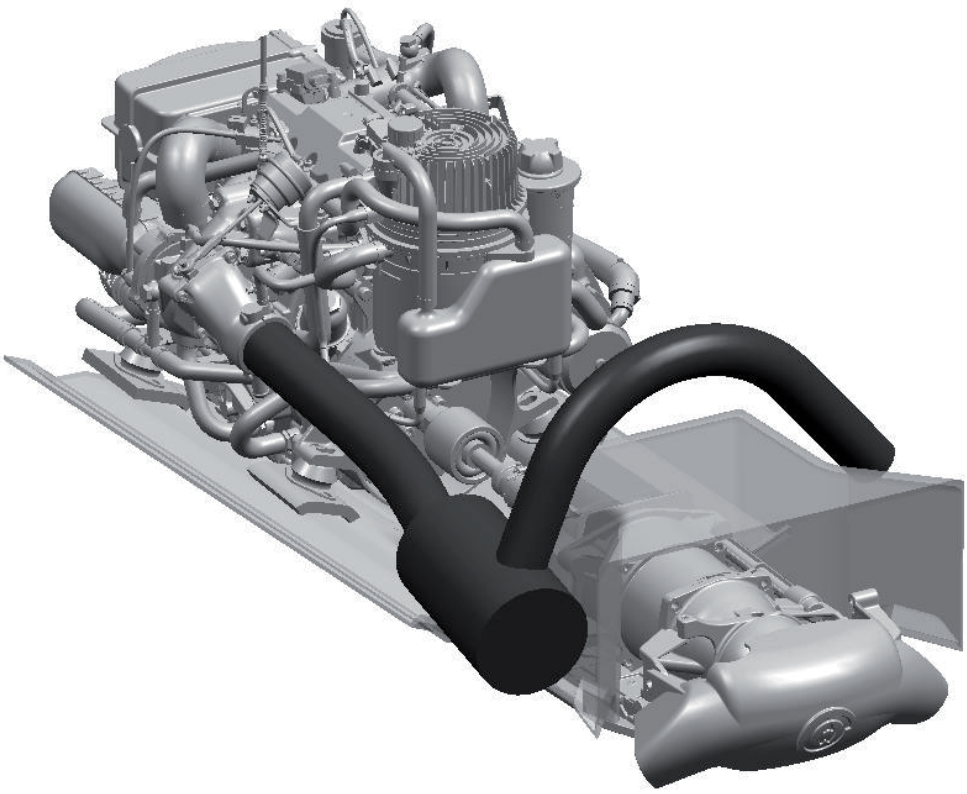


5 Exhaust System

Engine exhaust manifold and muffler can be connected by a rubber tube, e.g. Marine exhaust tube by VETUS.

The muffler should have a volume of approximately 17 Liter and the back pressure of the whole exhaust system has to be: max. 200 mbar - 143 hp
max. 180 mbar - 104 hp

To avoid a filling of the exhaust system e.g. by the stern wave or during boat slip, the layout should look like shown in the following picture



6 Electric

The engine will be delivered including an engine wire harness and Engine ECU. All necessary connectors for the vehicle wire hardness are listed in section 6.4. Also diameters of the wires in the vehicle harness have to match the diameters of the engine harness.

6.1 Electric

The engine can give out following output / informations:

- MIL (Malfunktion Indicator Light): Will be activated when engine performance is limited
- Engine overtemperature lamp: Is activated when engine temperature exceed the limit
- Oil pressure lamp
- Engine speed signal
- Engine up to 98 kW: 2 pulses/rev
- Engine 105 kW: 6 pulses/rev

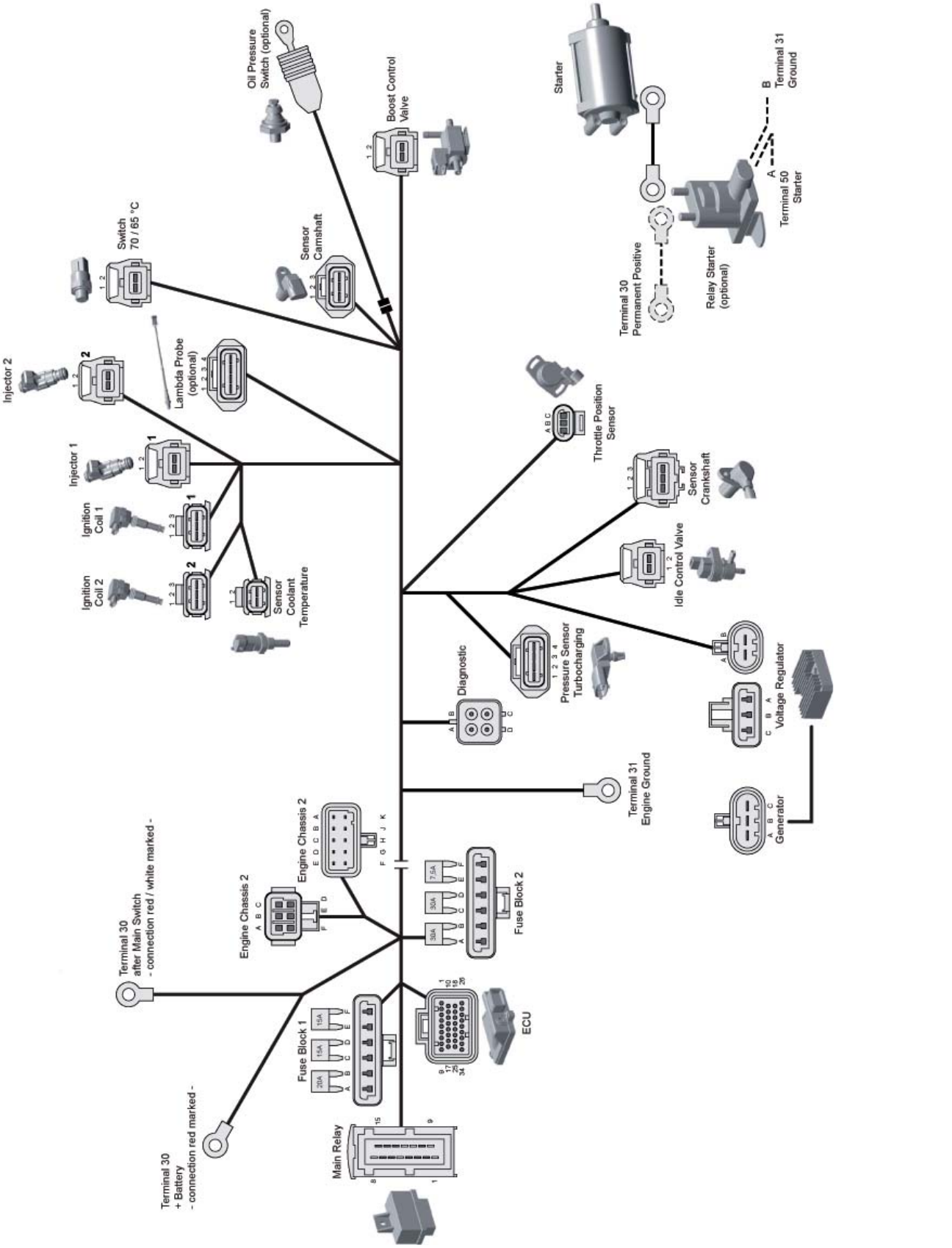
The wireing for the oil pressure lamp is not included in the engine wire harness and has to be implemented in the boat harness.

The EMS / engine package includes sensors and control strategies for:

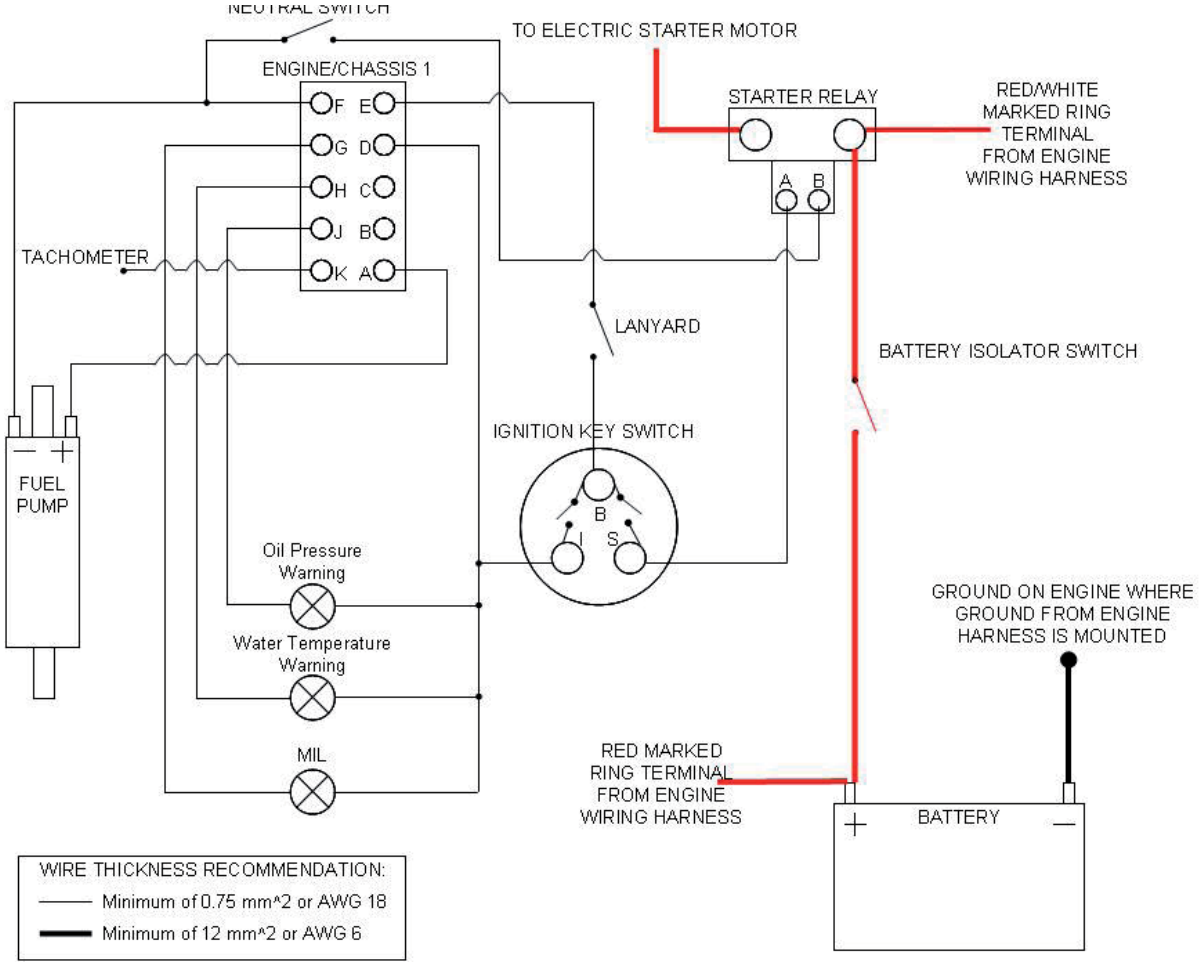
- Raw water supply: temperature sensor in exhaust manifold
- Altitude: air pressure sensor
- Temperature: air and coolant temperature
- RPM: Crank sensor
- Start: Phase sensor for cylinder 1 detection
- Turbo System: pressure sensor for boost control
- Oil System: oil pressure switch to warning lamp
- Emissions / Performance: closed loop lamda control

	Specification
Malfunktion Indicator Light (MIL)	max. 10 Watt
engine overtemperature lamp	max. 10 Watt
oil pressure lamp	max. 10 Watt
engine speed signal	Engine up to 98 kW: 2 pulses/rev Engine 105 kW: 6 pulses/rev
battery capacity	12 V / 10 Ah
starter solenoid	600 A steady state
internal generator with regulator	Idle: 150 Watt > 3000rpm: Watt max. 340 Watt

6.2 Schema engine wire harness



6.3 Schema boat wire harness



6.4 Required connectors for boat harness

Following table shows the connector parts needed fort he boat wire harness:

Connector to the engine wire harness (Engine / Chassis 1):

Description	Manufacturer	Series	Part Number	Quantity
Connector Housing 10 Cavities Female	Delphi / Packard	Metri Pack 150	12065425	1
Terminal Position Assurance 10	Delphi / Packard	Metri Pack 150	12124264	1
Female Terminals	Delphi / Packard	Metri Pack 150	12048074	8
cable seals	Delphi / Packard	Metri Pack 150	12048087	8
cavity plug	Delphi / Packard	Metri Pack 150	12059168	2

Connector starter relay:

Description	Manufacturer	Series	Part Number	Quantity
Connector Assembly 2F	Delphi / Packard	Metri Pack 150	12162195	1
Female Terminals	Delphi / Packard	Metri Pack 150	12124075	2

All components for the connectors can be purchased at:

www. powerandsignal.com

7 First engine run and brake in

After the engine installation is finished a first run with the boat out of the water is recommended. Therefor use the flush system to avoid any damage of the engine due to overheat. The use of the flush system is described in section 4.2.

ATTENTION

Engine is delivered filled with engine oil by the factory

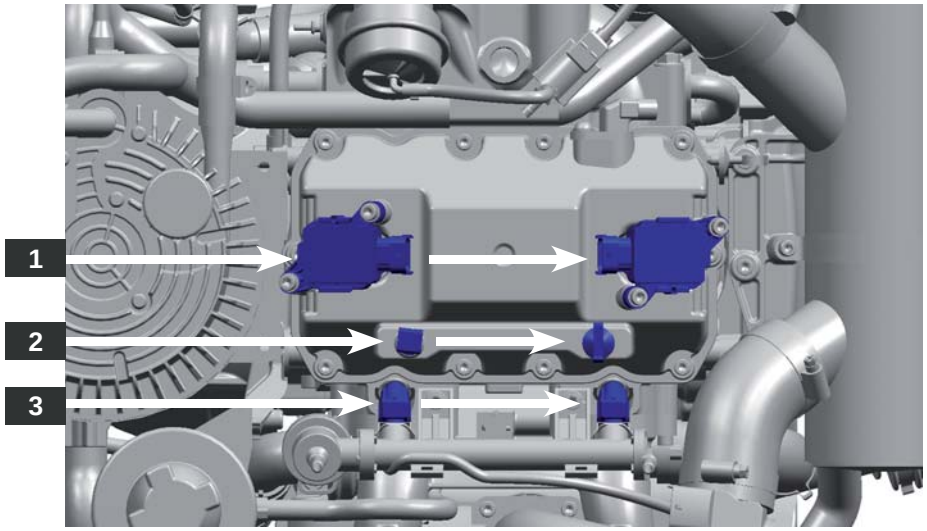
Procedure:

Check at first the connection to the drive train. Therefore disconnect the ignition coils to avoid a starting of the engine. Crank the engine by using the starter, do not crank longer than 10 seconds and repeat as needed. Check the drive train for abnormal behaviour (e.g. mechanical noise). Reconnect the ignition coils

1) Remove cable harness on the ignition coils (1).

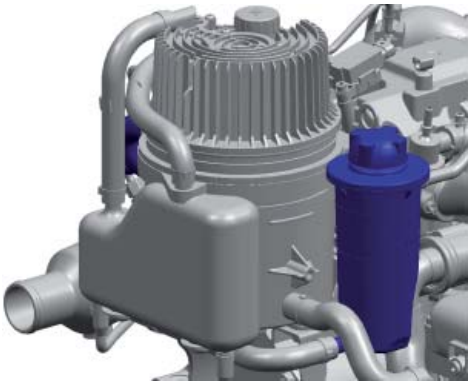
2) Loosen the cable harness on the cable holders (2).

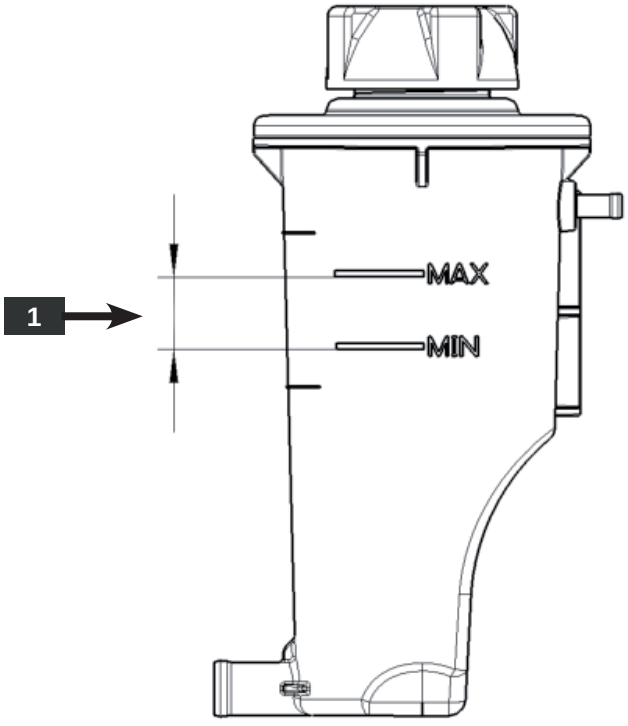
3) Remove the cable harness on the injection valves (3).



7 First engine run and brake in

- Prime the fuel system: Activate the fuel pump by turning on the key switch (not in start position).
- Connect the flush system as described in section 4.2
- Start engine. Do not accelerate. The engine may only be operated at idle speed for a maximum of 30 seconds without sea water
- Ensure the water supply within 30 seconds
- Check if the water out of the outer cooling loop is leaving the boat.
- Check if the injected water is leaving the exhaust
- Stop water supply
- Check oil level as described on the hang tang on the oil tank
- Check coolant level (1) of the inner cooling loop





ATTENTION

Coolant level below the MIN marking can cause damage to the engine due to overheating.

Coolant level below the MAX marking should be avoided to prevent environmental damage

8 Maintenance

Following table shows the maintenance intervals for the marine engine.

Activity	Procedure	see page	1st maintenance h [1] after 25	Maintenance interval h [1] every 50	Maintenance interval h [1] every 100	At end of season
Motor oil and oil filter	Change	14	■ [2]	■ [2]		■
Coolant	Change	20	■ every 4 years [4]			
Spark plugs	Check / clean	23				■
	Change	23			■ [3]	
Valve play	Check / set	26	■ [3]		■ [3]	
Fuel filter	Change	32			■ [3]	

[1] h = hours of operation

[2] or at least once a year if the hours of operation specified above are not reached before that.

[3] or at least every two years if the hours of operation specified above are not reached before that.

[4] Valid for engine manufacturer's fill. Please note the instructions provided by coolant manufacturer, when using other coolants.

For detailed maintenance informations please consult the service handbook.

This handbook can be downloaded in the service section at:

www.weber-motor.com

9 Engine Serial Release

The engine installation and function has to be released by Weber Automotive before warranty will cover the product. Therefore two ways are possible:

- Installation check by Weber Automotive, this service will be quoted on a time travel and mateial basis
- Installation by customer: the customer has to provide evidence of the engine installation and function

Both ways will be documented in a release document by Weber Automotive.

10 Specification for fuel, oil and coolant

Fuel:

Fuel quality	Unleaded gasoline according to DIN 51607 („super unleaded“), with an octane rating of at least 95 ROZ [RON] or 85 MOZ [MON]

Oil:

Recommendiation:	15W 50 completely synthetic, API SH, JASO MA
Alternative	0W 50
Fill quantity	Initial filling 4.2 liters [4.4 qt (US)]
	Oil change with filter 3.3 - 3.5 liters
	[3.5 - 3.7 qt (US)]

Coolant:

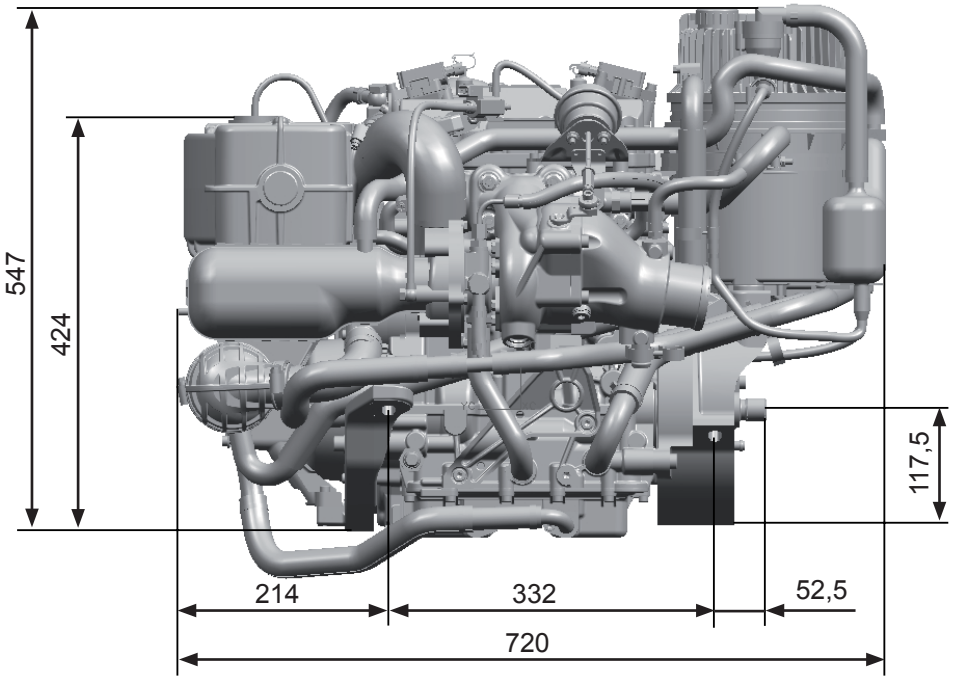
Coolant additive:	Coolant additive based on ethylene glycolsilicate and nitrite-free. Suitable for aluminium engines.
Anti-freeze mixture	50% water + 50% coolant additive
Fill quantity	3.3 liters [3.5 qt (US)]
Approved coolant additives	BASF Glysantin G30
	Chevron Havoline Extended Life Coolant XTC+B
	Valvoline Zerex G30

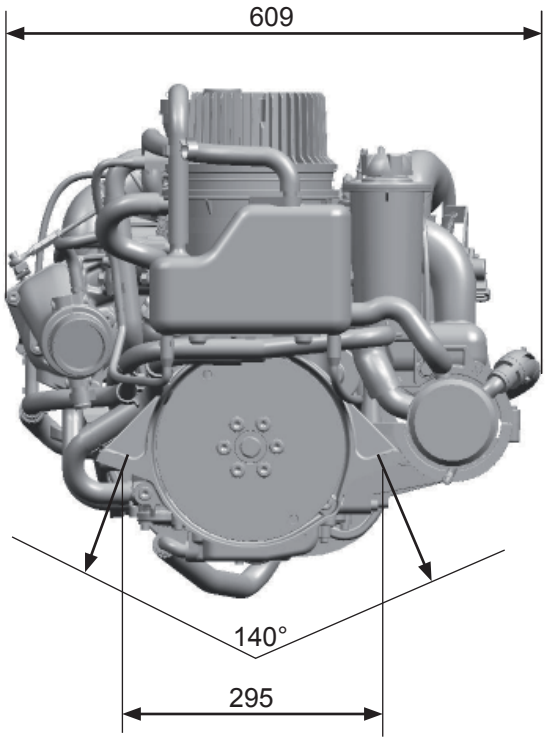
Manufacturer´s fill provides frost protection up to -37°C [-34.6°F]

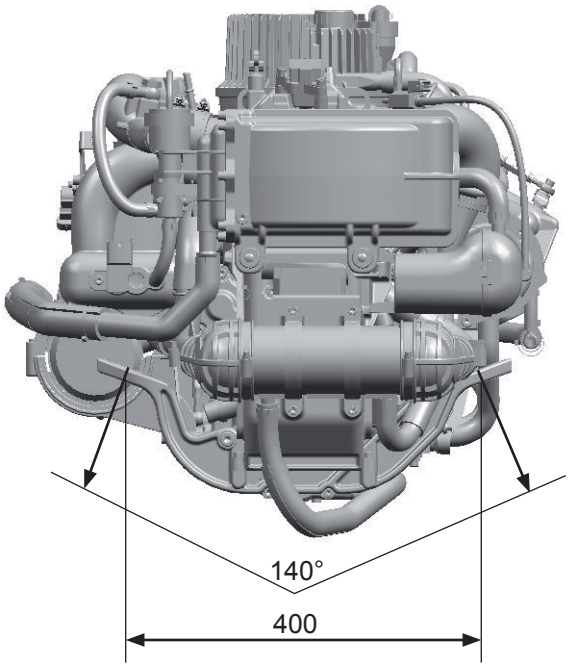
Recommended minimum frost protection up to -30°C [-22°F]

11 Basic dimensions [mm]

Please contact Weber Automotive for detailed drawings or CAD models.







12 Reference Adresses

Throttle cable:	RCS: Remote Control Systems GmbH www.r-c-s-online.de Contact Mr. Frank Schneider Frank.Schneider@r-c-s-online.de
Helm Throttle Level:	Teleflex www.teleflexmorse.com Allpa Marine Equipment www.allpa.nl www.allpa.de www.allpa.eu
Exhaust Tube:	Vetus Allpa Marine Equipment www.allpa.nl www.allpa.de www.allpa.eu
Engine Monitoring:	VDO Marine www.vdo-marine.com Contact Mr. Joachim Smolka smolka@kienzle.de
Connector:	Power&Signal Group www.powerandsignal.com